

Repair, don't replace, burner-register linkages

Appalachian Power Co's (APC) Amos station has two 800-MW supercritical boilers, both installed in the early 1970s. Each produces 5.28-million lb/hr of 3515-psig/1010F main steam. After 20 years, normal wear and tear on the burner air registers have contributed to poor control-setting repeatability for the electric-actuator-driven secondary-air vanes. Proper register settings are crucial to establishing correct flame shape and stability. Improper register settings can lead to poor combustion efficiency, increased particulate emissions, accelerated slagging, and tube wastage.

Problem. Close inspection by Amos plant engineers revealed substantial wear on the circumferential linkage assembly that connects all the secondary-air vane levers and permits simultaneous opening and closing of all vanes (Fig 1). The original hardware for each assembly includes sixty-six 7.5-in.-long carbon steel links that attach tangentially to the vane levers. At the end of each link is a 0.38-in.-diameter hole through which a loose link pin connects the link to a vane lever. The pin is secured by a washer and cotter pin at each end. Years of normal wear enlarged the holes in both the vane arms and links, resulting in excessive "play" between components—and vane settings that were off by up to 40%.

Solution. Changing all of the vane arms would have been an expensive and time-consuming task—a conservative estimate

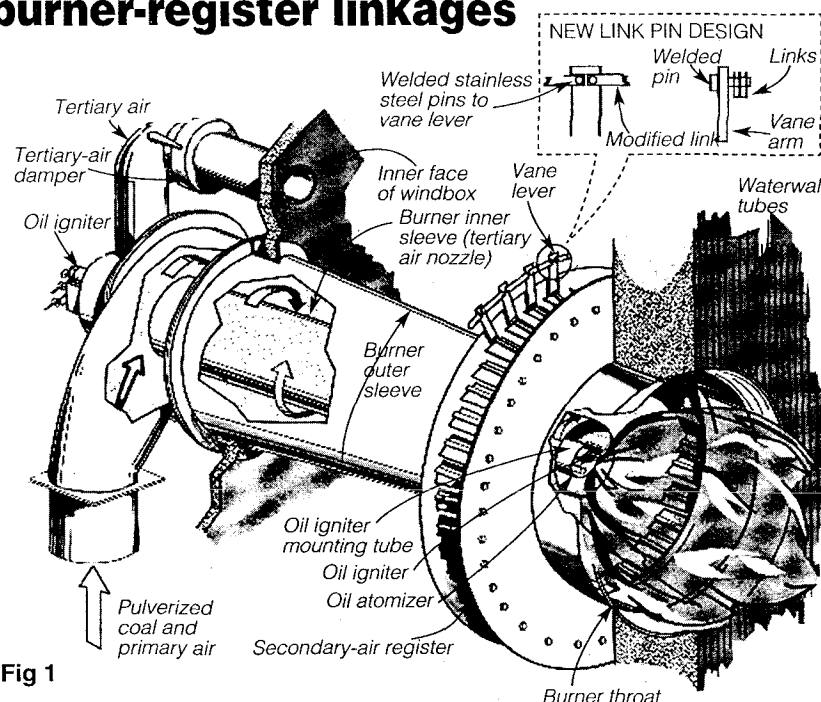


Fig 1

of total cost for this option is a \$500,000 per boiler. Instead, Engineers John Lester and Wayne Purdue teamed with Steve Buchanan of APC's parent firm, American Electric Power Service Corp (AEP), to implement a solution that cost only \$20,000 for both boilers, including parts and labor.

Amos personnel welded two stainless steel link pins at the end of each lever. New links were then installed. These were

identical to the originals except the end holes were drilled to have a diameter only 0.01 in. larger than that of the connecting pins. This tighter clearance both reduces play and limits the excessive wear rates associated with a loose, uneven fit. When the assembly does eventually wear, only the carbon-steel links should require replacement—instead of both the links and the vane arms, as was the case with the original design.

Analyze flame parameters on-line to improve combustion control

Burner flames are usually monitored for safety reasons. Example: When a flame failure is detected, the fuel valve automatically closes to prevent an explosion. Detectors also verify the presence of a pilot flame before main fuel is fed to a burner. More advanced systems may use a combination of detectors to monitor flame flicker, a basic indication of flame stability. Still, the information generated by these systems rarely influences the control and optimization of combustion. In an effort to improve efficiency, lower operating costs, and reduce emissions from its powerplants, the utility Imatran Voima Oy (IVO), Vantaa, Finland, integrates flame monitoring and analysis into the combustion-control scheme. The system, called Digital Monitoring and Analysis of Combustion (Dimac) by IVO, is now installed at five

powerplants on two different types of boilers firing a variety of fuels.

Here's how Dimac works: Air-cooled semiconductor-type cameras monitor individual burners. Each camera is mounted within a protective housing and protrudes into the furnace at a 90-deg angle to the burner being monitored (Fig 2). The cameras generate analog video signals, which are converted to a workable digital form in the system's image-analyzing boards.

The flame image is divided into very small increments, each of which corresponds to one of 256 gray-scale values.

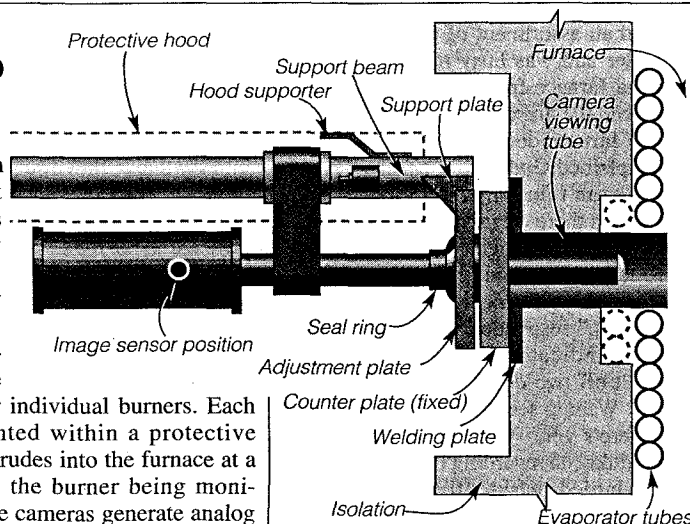


Fig 2

These digital values are then processed to measure combustion-related parameters. Using digital values also permits the stor-